

A NEW SUBGENUS OF THE GENUS *SABETHES* (DIPTERA: CULICIDAE)¹

RALPH E. HARBACH²

Walter Reed Biosystematics Unit, Department of Entomology, Walter Reed Army Institute of Research, Washington, DC 20307-5100.

ABSTRACT. A new subgenus, *Peytonulus*, of the genus *Sabethes* Robineau-Desvoidy is established for seven species previously included in the subgenus *Sabethinus* Lutz. The subgenus is contrasted with the other subgenera of *Sabethes* and the type species is illustrated.

INTRODUCTION

Because mosquitoes of the genus *Sabethes* Robineau-Desvoidy are known to harbor and transmit arboviruses (Galindo et al. 1959, Mattingly et al. 1973), information on their identification and phylogenetic relationships is of great importance. This is the third in a series of papers that deals with taxonomic problems involving nominal taxa within this genus. The first paper dealt with the transfer of a species from *Sabethes* to a new subgenus in *Wyeomyia* Theobald (Harbach and Peyton 1990a). The second dealt with the transfer of the subgenus *Davismyia* Lane and Cerqueira and its type species from *Wyeomyia* to *Sabethes* (Harbach and Peyton 1990b).

On reviewing the genus *Sabethes*, it became apparent that the species presently included in the subgenus *Sabethinus* Lutz actually belong to two separate phyletic lines. In this paper, a new subgenus is introduced for seven of these species: *aurescens* (Lutz), *fabricii* Lane and Cerqueira, *gorgasi* Duret, *identicus* Dyar and Knab, *soperi* Lane and Cerqueira, *undosus* (Coquillett), and *whitmani* Lane and Cerqueira. This action leaves only *intermedius* Lutz, the type species, and *melanonymphe* Dyar within the subgenus *Sabethinus*.

The new subgenus is uniquely characterized by several autapomorphic features, the highly modified larval seta 1-VII and its missing pupal homolog being the most notable and conspicuous. Based on these distinctive features, the subgenus *Peytonulus* is erected for the seven species listed above, and the following information is provided for its separation from the other subgenera within the genus *Sabethes*.

The descriptive terminology and abbreviations follow Harbach and Knight (1980, 1982) and Harbach and Peyton (1990a, 1990b). The illustrations are based on specimens deposited in the National Museum of Natural History, Smithsonian Institution.

TAXONOMIC TREATMENT

Sabethes subgenus *Peytonulus*, New Subgenus

Type species (Figs. 1-3). *Sabethinus aurescens* Lutz, 1905.

Sabethes (*Sabethinus*) in part of Lane and Cerqueira, 1942: 481, 659-662, 676, 679-688; Lane, 1953: 1055-1060, 1082-1096; Stone et al., 1959: 93-94; Knight and Stone, 1977: 307-308; and authors.

Sabethoides (*Sabethinus*) in part of da Costa Lima, 1931: 56, 59, 60-61, 62-63; and authors.

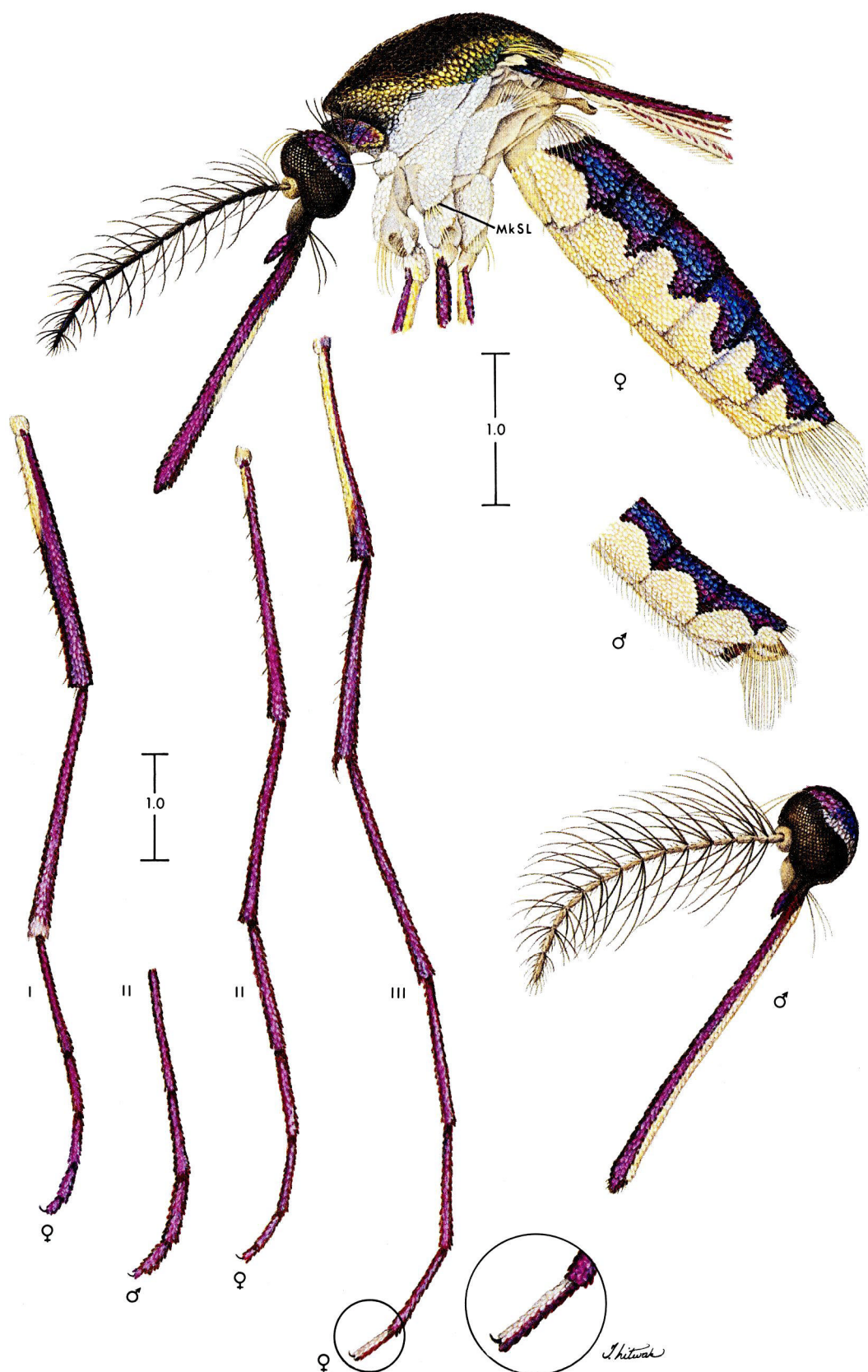
Sabethinus in part of Theobald, 1907: 618; Theobald, 1910: 586; Howard et al., 1915: 31-37; and authors.

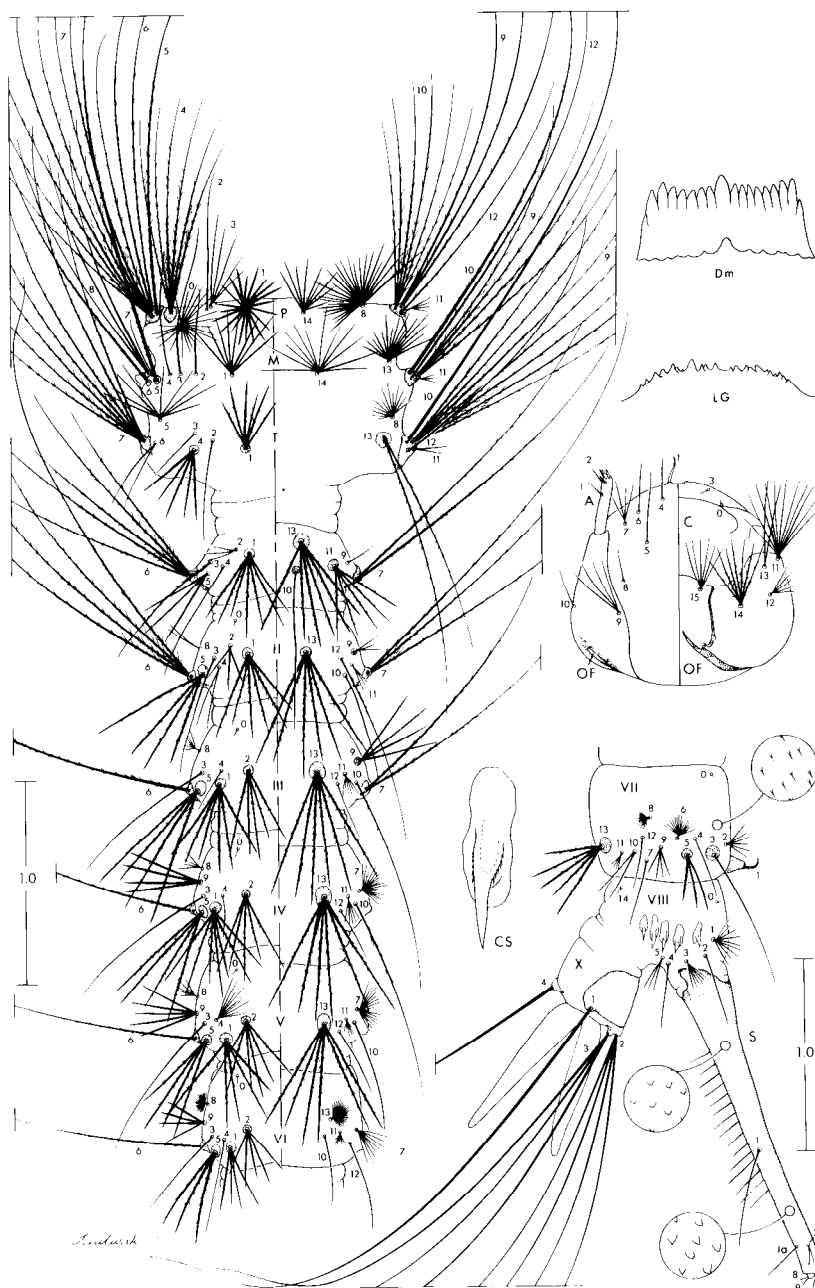
Sabethes (*Sabethoides*) in part of Dyar, 1924: 97-98; and authors.

¹The views of the author do not purport to reflect the views of the Department of the Army or the Department of Defense.

²Reprint requests: Walter Reed Biosystematics Unit, Museum Support Center, Smithsonian Institution, Washington, DC 20560.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE AUG 1991		2. REPORT TYPE		3. DATES COVERED 00-00-1991 to 00-00-1991	
4. TITLE AND SUBTITLE A New Subgenus of the Genus Sabethes (Diptera: Culicidae)				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Walter Reed Army Institute of Research, Department of Entomology, Washington, DC, 20307				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 10	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			





(Facing Page) Fig. 1. Adult habitus of *Sabethes (Peytonulus) aurescens* (based on specimens from the State of Sao Paulo, Brazil). Coloration is characteristic of all but one undescribed species of the subgenus. The presence of lower mesokatepisternal setae (MkSL) distinguish species of *Peytonulus* from those of *Sabethinus*.

(This page) Fig. 2. Fourth-instar larva of *Sabethes (Peytonulus) aurescens* (based on specimens from the State of Sao Paulo, Brazil). The modified seta 1-VII is diagnostic for the subgenus.

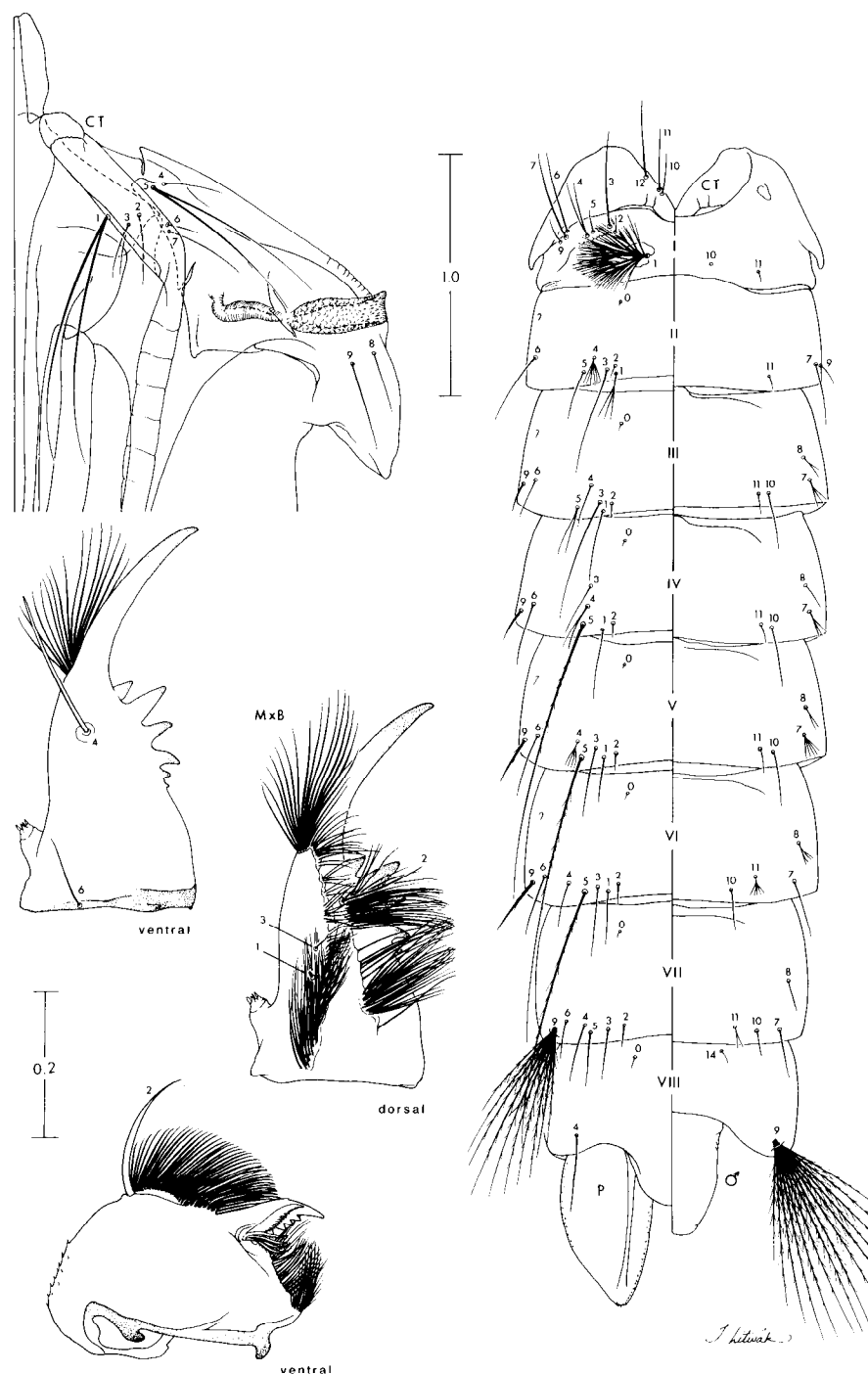


Fig. 3. Pupa and mouthparts of the fourth-instar larva of *Sabethes (Peytonulus) aurescens* (based on specimens from the State of Sao Paulo, Brazil). The absence of seta 1-VII is diagnostic for the subgenus. The large, elongate maxilla with its well developed teeth and long terminal clawlike process are characteristic of all species within this group.

Sabethoides in part of Theobald, 1910: 584; Bonne and Bonne-Wepster, 1925: 22, 37-41; Dyar, 1928: 6, 16-17, 21-24; Edwards, 1932: 80-81; and authors.

Except for the adult stage of one undescribed species which lacks metallic scutal scaling and bears certain other stasimorphic characters, this subgenus possesses the general characteristics of the genus *Sabethes* as noted by Harbach and Peyton (1990b). It differs from the other subgenera in the diagnostic and differential features given below. These features are illustrated in figures 1-4 and contrasted with homologous features in the other subgenera in Table 1.

Adult. Adults of the subgenus *Peytonulus* are readily recognized by the following combination of characters: thorax with upper proepisternal and lower mesokatepisternal setae; legs without paddles, midleg entirely dark-scaled; most species with conspicuous white scaling on ventral surface of hindtarsomere 5.

Larva. Maxilla large, with well developed teeth (= laciniastrum 1) and long terminal clawlike process; seta 4-C in line with or lateral to 1-C, normally lateral; seta 8-T anterior or anteroventral to pleural setal group; seta 1-I mesal to 2-I; seta 10-I in line with or mesal to 13-I, usually mesal; seta 9-II,III anterior or anteroventral to seta 7; seta 12-IV,V lateral to seta 13; seta 1-VII uniquely developed into a stout spine-, hook- or clawlike process borne on a prominent tubercle, apparently not innervated, without pupal homolog (Fig. 4); comb with relatively few large spines, without comb plate; setae 1a,2a-S not duplicated; auxiliary seta 4b-X absent.

Pupa. Seta 5-III much smaller than 5-IV-VI; seta 9-III-VI often spinelike; seta 1-VII absent; seta 8-VII ventral, small; paddle normal, without differentiated membranous dorsal area at base.

Etymology. The subgeneric name is a Latinized diminutive patronym to recognize E.L. Peyton for his special knowledge of sabethine mosquitoes and his many contributions to the field of mosquito systematics. The three-letter abbreviation *Pey.* is recommended for this subgenus.

Discussion. *Peytonulus* exhibits the most divergent morphology of any subgenus of *Sabethes*. Larvae of this group possess a uniquely specialized seta 1-VII which reaches terminal development in the fourth instar, i.e., it does not develop in the pupal stage. This ontogenetic distinction represents a synapomorphy for *Peytonulus*. Nevertheless, species of this group, like many other groups of mosquitoes, are mosaics of primitive and derived characters. The undescribed species mentioned above is a good example of this. It shares a plesiomorphy with *Wyeomyia* in the retention of dull scutal scaling, yet bears the autapomorphic immature characters diagnostic of *Peytonulus*.

The species included in *Peytonulus* were formerly placed in *Sabethinus*. These subgenera, however, have very little in common other than overt similarities in the ornamentation of the adults. Based on character agreement, *Peytonulus* appears to be more closely related to *Sabethoides* and *Davismyia*. Nevertheless, these three subgenera differ rather markedly in all stages as indicated in Table 1. Particularly noteworthy is the presence of prealar setae in the adults of *Davismyia*. Prealar setae are plesiomorphic for *Sabethes* and represent a clear case of symplesiomorphy with *Wyeomyia*.

Although *Peytonulus* seems to show affinities with *Davismyia* and *Sabethoides*, the morphological data have not been thoroughly compared against all species of the subgenus *Sabethes*. This subgenus is poorly known at present and appears to be a rather heterogeneous assemblage of species. Thus, the relationships suggested here are tentative and await further analysis of the entire genus.

ACKNOWLEDGMENTS

The author is grateful to R.C. Wilkerson, R.A. Ward, E.L. Peyton, V.L. Mallampalli, B.A. Harrison and J.I. Glick for commenting on the manuscript; Taina Litwak is especially acknowledged for masterfully preparing the illustrations; and J.E. Pecor is thanked for typing parts of the manuscript.

Table 1. Comparison of diagnostic and differential characters for the five subgenera of *Sabethes*.

Stage	Character	<i>Peytonulus</i>	<i>Sabethes</i>	<i>Sabethoides</i>	<i>Sabethinus</i>	<i>Davismyia</i>
Adult	Prealar setae	No	No	No	No	Yes
	Upper proepisternal setae	Yes	No, except <i>batesi</i>	Yes	Yes	Yes
	Lower mesokat-episternal setae	Yes	Yes/no, variable	Yes	No	Yes
	Leg paddles	No	Yes, but not all species	No	No	No
	Midtarsus largely white-scaled on ventral side	No	No, but some species with white scaling on both sides	Yes	No	No, but females with some white scaling on ventral side
Larva	Seta 4-C lateral to 1-C	Yes, rarely in line with 1-C	Yes/no, usually mesal to 1-C	No, mesal to 1-C	Yes, occasionally in line with 1-C	Yes
	Seta 8-T anterior or anteroventral to 9-T	Yes	No, dorsal or anterodorsal to 9-T	No, dorsal or anterodorsal to 9-T	Yes/no anteroventral or ventral to 9-T	No, dorsal to 9-T
	Seta 1-I mesal to 2-I	Yes	Yes	Yes	No, lateral to 2-I	No, lateral to 2-I
	Seta 10-I in line with or mesal to 13-I, usually mesal	Yes	No, in line with or lateral to 13-I, usually lateral	Yes	No, in line with or lateral to 13-I	No, far lateral to 13-I
	Seta 9-II,III anterior or anteroventral to seta 7, usually anteroventral	Yes	No, anterior or anterolateral to 7	Yes	Yes/no, sometimes anterolateral on segment III	Yes

	Seta 12-IV,V lateral to seta 13	Yes	Yes/no, usually mesal to 13	Yes	Yes	Yes
	Seta 1-VII modified, on tubercle, mesal to seta 2	Yes	No, normal, lateral to 2	No, normal, lateral to 2	No, normal, posterior to 2	No, normal, lateral to 2
	Comb scales large, separated	Yes	No, smaller, close-set	No, smaller, close-set	Yes	Yes
	Comb plate present	No	No	No	Yes	No
	Setae 1a,2a-S each represented by one seta	Yes	Yes/no, each usually duplicated	Yes, except <i>chloropterus</i>	Yes	Yes
	Auxiliary seta 4b-X present	No	No	No	Yes	No
	Siphon long and slender	Yes	No	No, except <i>chloropterus</i>	Yes	No
Pupa	Seta 5-III much smaller than 5-IV-VI	Yes	Yes, except <i>shannoni</i> and <i>purpureus</i>	Yes	Yes	No, as large as 5-IV-VI
	Seta 1-VII present	No	Yes	Yes	Yes	Yes
	Seta 8-VII normal, ventral	Yes	Yes	Yes	No, very large, dorsal	Yes
	Paddle normal	Yes	Yes/no, some species with differentiated membranous area at base dorsally	No, with differentiated membranous area at base dorsally	Yes	Yes

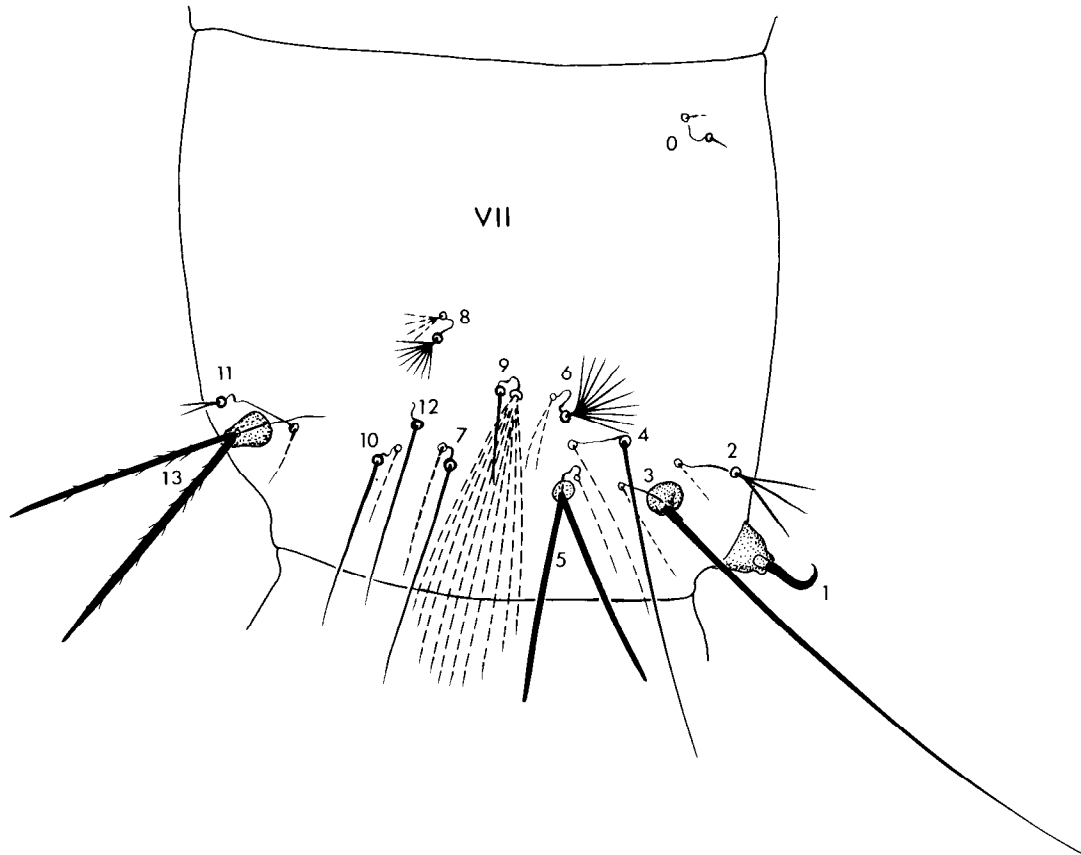


Fig. 4. Lateral view of abdominal segment VII of the prepupal stage of *Sabethes (Peytonulus) undosus* showing the neural connections between larval and developing pupal setae. Note that seta 1 is not innervated in the larva and absent in the pupa. Setae 12 and 13 are innervated in the larva but their structural homologs are absent in the pupa. Illustration is based on specimen number TR 700-1A (from Trinidad) in the NMNH.

REFERENCES CITED

- Bonne, C. and J. Bonne-Wepster. 1925. Mosquitoes of Surinam, a study on neotropical mosquitoes. Meded. K. Inst. Amst. 21 (Trop. Hyg. No. 13). 558 pp., 31 pl.
- da Costa Lima, A. 1931. Sobre as especies dos generos *Sabethes* e *Sabethoides* (Diptera: Culicidae). Mem. Inst. Oswaldo Cruz Rio De J. 25:51-64, 3 pl.
- Dyar, H.G. 1924. A note on *Sabethes* Robin-eau-Desvoidy (Diptera, Culicidae). Insec. Inscit. Menst. 12:97-100.
- Dyar, H.G. 1928. The mosquitoes of the Americas. Part I. Carnegie Inst. Wash. Publ. No. 387. 616 pp.
- Edwards, F.W. 1932. Genera Insectorum. Diptera. Fam. Culicidae. Fascicle 194. Desmet-Verteneuil, Brussels, Belgium. 258 pp.
- Galindo, P., E. de Rodaniche and C.M. Johnson. 1959. St. Louis encephalitis in Panama I. Isolation of the virus from forest mosquitoes

- and human blood. *Am. J. Trop. Med. Hyg.* 8:557-560.
- Harbach, R.E. and K.L. Knight. 1980. *Taxonomists' glossary of mosquito anatomy*. Plexus Publishing, Inc., Marlton, NJ. xi + 415 pp.
- Harbach, R.E. and K.L. Knight. 1982. Corrections and additions to *Taxonomists' glossary of mosquito anatomy*. *Mosq. Syst.* (1981) 13:201-217.
- Harbach, R.E. and E.L. Peyton. 1990a. A new subgenus in *Wyeomyia* (Diptera: Culicidae), with the reclassification and redescription of the type species, *Sabethes fernandezyepezi*. *Mosq. Syst.* 22:15-23.
- Harbach, R.E. and E.L. Peyton. 1990b. Transfer of the subgenus *Davismyia* from *Wyeomyia* to *Sabethes* and description of the type species, *Miamyia petrocchiai* (Diptera: Culicidae). *Mosq. Syst.* 22:149-159.
- Howard, L.O., H.G. Dyar and F. Knab. 1915. The mosquitoes of North and Central America and the West Indies. Vol. 3. Systematic description (in two parts). Part 1. Carnegie Inst. Wash. Publ. No. 159. 523 pp.
- Knight, K.L. and A. Stone. 1977. A catalog of the mosquitoes of the world (Diptera: Culicidae). 2nd edition. Thomas Say Found. 6:xi + 611 pp.
- Lane, J. 1953. Neotropical Culicidae. Vols. 1 and 2. University of Sao Paulo, Sao Paulo, Brazil. 1,112 pp.
- Lane, J. and N.L. Cerqueira. 1942. Os sabetineos da America (Diptera, Culicidae). *Arq. Zool. Estado Sao Paulo* 3:473-849.
- Lutz, A. 1905. Novas especies de mosquitos do Brasil. *Imprensa Med.* 13(18):347-350.
- Mattingly, P.F., R.W. Crosskey and K.G.V. Smith. 1973. 19. Summary of arthropod vectors, pp. 497-532. In: K.G.V. Smith (ed.). *Insects and other arthropods of medical importance*. British Museum (Natural History), London.
- Stone, A., K.L. Knight and H. Starcke. 1959. A synoptic catalog of the mosquitoes of the world (Diptera, Culicidae). Thomas Say Found. 6:358 pp.
- Theobald, F.V. 1907. A monograph of the Culicidae or mosquitoes. Vol. 4. British Museum (Natural History), London. xix + 639 pp., 16 pl.
- Theobald, F.V. 1910. A monograph of the Culicidae or mosquitoes. Vol. 5. British Museum (Natural History), London. xv + 646 pp., 6 pl.

